

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:)	Before the Examiner
)	
Michael T. Meyer)	Group Art Unit
)	
Serial No. 10/635,101)	
)	
Filed: August 6, 2003)	
)	
APPARATUS FOR HEAT TRANSFER)	
AND CRITICAL HEAT FLUX)	
ENHANCEMENT)	October 6, 2003

INFORMATION DISCLOSURE STATEMENT

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Alexandria, VA 22313-1450

Sir:

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The references are listed on the attached Form 1449.

Copies of cited items are enclosed herewith.

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Clifford W. Browning
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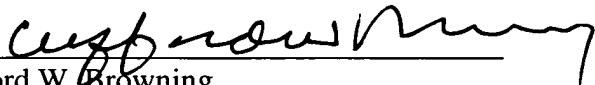

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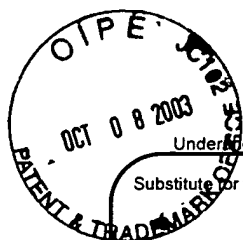
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Respectfully submitted

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Application Number	10/635,101
Filing Date	August 6, 2003
First Named Inventor	Michael T. Meyer
Art Unit	
Examiner Name	
Attorney Docket Number	16380-4
Sheet 1 of 3	

NON PATENT LITERATURE DOCUMENTS

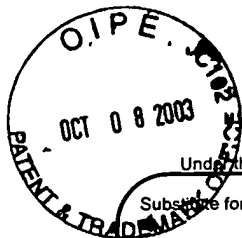
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		BOWERS, M.B. et al., High flux boiling in low flow rate, low pressure mini-channel and micro-channel heat sinks. Int. J. Heat Mass Transfer, Vol. 37, No. 2, pp.321-332, 1994, Great Britain.	
		BOWERS, M.B. et al., Two-Phase Electronic Cooling Using Mini-Channel and Micro-Channel Heat Sinks: Part 1 - Design Criteria and Heat Diffusion Constraints. Transactions of the ASME, Vol. 116, pp. 290-297, December 1994.	
		BOWERS, M.B. et al., Two-Phase Electronic Cooling Using Mini-Channel and Micro-Channel Heat Sinks: Part 2 - Flow Rate and Pressure Drop Constraints. Transactions of the ASME, Vol. 116, pp. 298-305, December 1994.	
		COLLIER, John G. et al., Convective Boiling and Condensation, 3rd Ed., Ch. 5, pp. 183-219, Oxford Science Publications, Clarendon Press, Oxford.	
		GALLOWAY, J.E. et al., CHF mechanism in flow boiling from a short heated wall - I. Examination of near-wall conditions with the aid of photomicrography and high-speed video imaging. Int. J. Heat Mass Transfer, Vol. 36, No. 10, pp. 2511-2526, 1993, G.B.	
		GERSEY, C.O. et al., Effects of Orientation on Critical Heat Flux From Chip Arrays During Flow Boiling. Transactions of the ASME, Vol. 114, pp. 290-299, September 1992.	
		GERSEY, C.O. et al., Orientation Effects on Critical Heat Flux from Discrete, In-Line Heat Sources in a Flow Channel. Journal of Heat Transfer, Vol. 115, pp. 973-985, November 1993.	
		JIMENEZ, Peter E. et al., A Multi-Kilowatt Immersion-Cooled Standard Electronic Clamshell Module for Future Aircraft Avionics. Transactions of the ASME, Vol. 116, pp. 220-229, September 1994.	
		KATTO, Y. et al., Upper Limit of CHF in the Saturated Forced Convection Boiling on a Heated Disk with a Small Impinging Jet. Journal of Heat Transfer, Vol. 101, pp. 265-269, May 1979.	
		MACKOWSKI, Michael J., Requirements for High Flux Cooling of Future Avionics Systems. SAE Technical Paper Series, 912104, Aerospace Technology Conference and Exposition, Long Beach, California, September 23-26, 1991.	

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Sheet	2	of	3
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NON PATENT LITERATURE DOCUMENTS

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		Maddox, D.E. et al., Single- and Two-Phase Convective Heat Transfer from Smooth and Enhanced Microelectric Heat Sources in a Rectangular Channel. Journal of Heat Transfer, Vol. 111, pp. 1045-1052, November 1989.	/
		MONDE, M. et al., Critical Heat Flux in Saturated Forced Convective Boiling on a Heated Disk with Multiple Impinging Jets. Transactions of the ASME, Vol. 113, pp. 722-727, August 1991	/
		MUDAWAR, I. et al., Direct-Immersion Cooling for High Power Electronic Chips, Intersociety Conference on Thermal Phenomena in Electronic Systems, Four Seasons Hotel, Austin, Texas, February 3-5, 1992.	/
		MUDAWAR, Prof. Issam, Keynote Address on Thermal Management. International Conference on Thermal, Mechanics and Thermomechanical Phenomena in Electronic Systems, Las Vegas, Nevada, May 23-26, 2000.	/
		MUDAWAR, I. et al., Optimization of Enhanced Surfaces for High Flux Chip Cooling by Pool Boiling. Journal of Electronic Packaging, Vol. 115, pp. 89-100, March 1993.	/
		MUDAWAR, I. et al. Immersion-Cooled Standard Electronic Clamshell Module: A Building Block for Future High-Flux Avionic Systems. Transactions of the ASME, Vol. 116, pp. 116-125, June 1994.	/
		MUDAWAR, I. et al., Critical heat flux in subcooled flow boiling of fluorocarbon liquid on a simulated electronic chip in a vertical rectangular channel. Int. J. Heat Mass Transfer, Vol. 32, No. 2, pp. 379-394, 1989, Great Britain.	/
		MUDAWAR, I. et al., Critical heat flux from a simulated chip to a confined rectangular impinging jet of dielectric liquid. Int. J. Heat Mass Transfer, Vol. 34, No. 6, pp. 1465-1479, 1991, Great Britain.	/
		NAKAYAMA, W. et al., Heat Sink Studs Having Enhanced Boiling Surfaces for Cooling of Microelectric Components. American Society of Mechanical Engineers, 84-WA/HT-89.	/
		PENG, X. F. et al., Forced convection and flow boiling heat transfer for liquid flowing through microchannels. Int. J. Heat Mass Transfer, Vol. 36, No. 14, pp. 3421-3427, 1993, Great Britain.	/

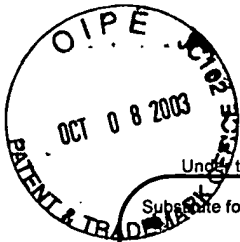
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		Advances in Thermal Modeling of Electronic Components and Systems, Vol. 2, ASME Press Series, New York, 1990.	/
		Ravigururajan, T.S., Impact of Channel Geometry on Two-Phase Flow Heat Transfer Characteristics of Refrigerants in Microchannel Heat Exchangers. Journal of Heat Transfer, Vol. 120, pp. 485-491, May 1998.	/
		RUCH, M.A. et al., Boiling Heat Transfer to a Freon-113 Jet Impinging Upward onto a Flat, Heated Surface. Int. J. Heat Mass Transfer, Vol. 18, pp. 51-60, Pergamon Press, 1975, Great Britain.	/
		TUCKERMAN, D.B. et al., High-Performance Heat Sinking for VLSI. IEEE Electron Device Letters, Vol. EDL-2, No. 5, pp. 126-129, May 1981.	/
		WILLINGHAM, T.C. et al., Channel height effects on forced-convection boiling and critical heat flux from a linear array of discrete heat sources. Int. J. Heat Mass Transfer, Vol. 35, No. 8, pp. 1865-1880, Great Britain 1992.	
		YAN, Yi-Yie et al., Evaporation heat transfer and pressure drop of refrigerant R-134a in a small pipe. Int. J. Heat Mass Transfer, Vol. 41, pp. 4183-4194, Pergamon Press 1998.	

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